UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Computer Science and Engineering
Box 352350
206 685-1227 / FAX 206 543-2969
salesin@cs.washington.edu

31 October 1995

Dr. Ralph Wachter
Program Manager/Officer ONR:311
Office of Naval Research
Ballston Tower One
800 North Quincy Street
Arlington, VA 22217-5660

Dear Dr. Wachter:

Here is a brief summary of some of the most significant advances during the past quarter, on ONR Young Investigator Award number N00014-95-1-0728:

Global illumination of glossy environments using wavelets and importance,[1] with Per Christensen (a UW Ph.D. student), Eric Stollnitz (a UW Ph.D. student in Applied Math), and Tony DeRose (a UW professor). In October, we sent in a revised and final draft of a journal paper to *ACM Transactions on Graphics*, which shows how importance-driven refinement and a wavelet basis can be combined to provide an efficient solution to the global illumination problem with glossy and diffuse reflections. Importance is used to focus the computation on the interactions having the greatest impact on the visible solution. Wavelets are used to provide an efficient representation of radiance, importance, and the transport operator. We discuss a number of choices that must be made when constructing a finite element algorithm for glossy global illumination. Our algorithm is based on the standard wavelet decomposition of the transport operator and makes use of a four-dimensional wavelet representation for spatially- and angularly-varying radiance distributions. We use a final gathering step to improve the visual quality of the solution. Features of our implementation include support for curved surfaces as well as texture-mapped anisotropic emission and reflection functions.

Rendering of complex environments using a spatial hierarchy,[2] with Bradford Chamber-

[1]Per H. Christensen, Eric J. Stollnitz, David H. Salesin, and T. DeRose. Global illumination of glossy environments using wavelets and importance. To appear in *ACM Transactions on Graphics*. An earlier version is available as Department of Computer Science and Engineering Technical Report TR 94-10-01, University of Washington, 1994.

[2]Bradford Chamberlain, Tony DeRose, Dani Lischinski, David Salesin, and John Snyder. Rendering of complex environments using a spatial hierarchy. Submitted to *Graphics Interface '96*. An earlier version is available as Department of Computer Science and Engineering Technical Report TR 95-05-02, University of Washington, 1995.

DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
SEATTLE REGIONAL OFFICE
1107 NE 45TH STREET. SUITE 350
SEATTLE WA 98105-4631

IN REPLY REFER TO:

4330
ONR 247
11 Jul 97

From: Director, Office of Naval Research, Seattle Regional Office, 1107 NE 45th St., Suite 350, Seattle, WA 98105
To: Defense Technical Center, Attn: P. Mawby, 8725 John J. Kingman Rd., Suite 0944, Ft. Belvoir, VA 22060-6218

Subj: RETURNED GRANTEE/CONTRACTOR TECHNICAL REPORTS

1. This confirms our conversations of 27 Feb 97 and 11 Jul 97. Enclosed are a number of technical reports which were returned to our agency for lack of clear distribution availability statement. This confirms that all reports are unclassified and are "APPROVED FOR PUBLIC RELEASE" with no restrictions.

2. Please contact me if you require additional information. My e-mail is *silverr@onr.navy.mil* and my phone is (206) 625-3196.

ROBERT J. SILVERMAN

lain (a UW Ph.D. student), Tony DeRose, Dani Lischinski, and John Snyder (at Microsoft Research). In October, we submitted a paper to *Graphics Interface '96*, which presents a new method for accelerating the rendering of complex static scenes. The technique is applicable to unstructured scenes containing arbitrary geometric primitives and has sublinear asymptotic complexity. Our approach is to construct a hierarchy of cells over the scene and to associate with each cell a simplified representation of its contents. The scene is then rendered using a traversal of the hierarchy in which a cell's approximation is drawn instead of its contents, if the approximation is sufficiently accurate. We apply the method to several different scenes and demonstrate significant speedups with little image degradation. We also exhibit and discuss some of the artifacts that our approximation may cause.

I would be more than happy to furnish either or both of these papers, or discuss any of this work in more detail, upon your request.

Sincerely,

David Salesin
Assistant Professor